METRIC

KSC-STD-E-0002C
SEPTEMBER 28, 1998

Supersedes
KSC-STD-E-0002B
June 1987

HAZARDPROOFING OF ELECTRICALLY ENERGIZED EQUIPMENT, STANDARD FOR

National Aeronautics and
Space Administration

John F. Kennedy Space Center

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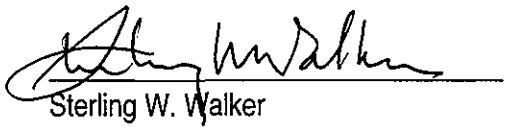
Approved:



Sterling W. Walker
Director of Engineering Development

JOHN F. KENNEDY SPACE CENTER, NASA

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1. SCOPE

This standard treats hazardproofing from the standpoint of preventing electrically energized equipment from igniting hazardous fluids (liquids and gases). It does not encompass hazardproofing requirements associated with lightning protection, grounding, operational safety, toxicity, chemical reactions, etc. This standard defines approved methods of hazardproofing electrically energized equipment for all types of John F. Kennedy Space Center (KSC) facilities.

When NASA handbooks (NHB's), National Fire Protection Association (NFPA), Occupational Safety and Health Administration (OSHA), etc., refer to the authority having jurisdiction (AHJ), the Lead Design Engineer shall coordinate with the Fire and Rescue Office for an AHJ-related decision. The ultimate AHJ authority resides with the NASA Fire and Rescue Office.

2. APPLICABLE DOCUMENTS

The following documents form a part of this document to the extent specified herein. When this document is used for procurement, including solicitation, or is added to an existing contract, the specific revision levels, amendments, and approval dates of said documents shall be specified in an attachment to the Solicitation/Statement of Work/Contract.

2.1 Governmental.

2.1.1 Specifications.

John F. Kennedy Space Center (KSC), NASA

KSC-SPEC-E-0031	Electrical Cables, General Specification for

2.2 Non-Governmental.

National Fire Protection Association

NFPA 70	National Electrical Code (NEC)

NFPA 430	Code for the Storage of Liquid and Solid Oxidizer
NFPA 496	Standard for Purged and Pressurized Enclosures for Electrical Equipment in Hazardous Locations
NFPA 497	Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas

(Application for copies should be addressed to the National Fire Protection Association, One Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.)

3. REQUIREMENTS

3.1 General. - Design for all new or modified electrical equipment to be used in hazardous locations shall comply with the applicable requirements of NFPA 70, NFPA 430, NFPA 496, and NFPA 497, except as modified by the provisions of this standard.

3.2 Hazardous Locations and Classifications. - The hazardous location classification pertains to the NEC designation. The criteria for hazardproofing equipment for the following hazardous substances are defined as follows:

Nitrogen tetroxide (N_2O_4) (oxidizer)	- Groups C and D
Solid propellants	- Group D

NFPA 497 does not list the above items as hazardous substances nor does it assign an NEC group classification based on hazardous characteristics.

3.3 Cabling. - Cabling shall be protected from spillage of liquid oxygen, hydrogen, or other propellants and from mechanical damage. No electrical lines of any type shall be located in trenches containing propellant lines. Instrumentation, communications, controls, and associated power equipment at KSC shall be permitted to be connected by hard-service cabling/cords specified in KSC-SPEC-E-0031.

3.4 Electrical Connections.

3.4.1 60-Hertz Electrical Connectors. - Electrical connectors for 60-hertz power cabling shall conform to the requirements of the NEC.

3.4.2 Meters, Instruments, and Relays. - The following are alternate methods to NEC 501-3(b)(6) and 501-11:

a. A means of disconnecting power to any connector shall be provided so that the connector is not depended upon to disconnect power. If the disconnecting means is located within the Class 1, Division 2 area it shall comply with NEC 501-3(b)(1).

b. Connectors classified as "weatherproof" with threaded coupling nuts are acceptable for use with instrumentation, communications, controls, and associated power cabling. The cabling associated with these connectors may be of any length as long as the current does not exceed 5 amperes at 32 volts direct current (dc) (instrumentation, controls, and associated power cabling) or 5 amperes at 52 volts dc (communications and associated power cabling).

3.5 Purging or Pressurization. - The use of enclosures designed in accordance with NFPA 496 for the purpose of eliminating or reducing within the enclosures the hazardous location classification, as defined in Article 500 of the NEC, shall be acceptable. Continuous flow purging and positive pressure shall be considered acceptable for hazardproofing in enclosure designs.

Monitoring of purged systems or Type X, Y, and Z pressurizing systems at the low-pressure side of the regulator station shall be considered acceptable for the required alarm called out in NFPA 496 to indicate failure of the protective gas supply. The purged/pressurization system shall be designed to prevent obstruction between the monitor point and the enclosures. The protective gas supply failure alarm shall be in a location that can be continuously monitored during a hazardous operation.

4. QUALITY ASSURANCE PROVISIONS

This section is not applicable.

5. PREPARATION FOR DELIVERY

This section is not applicable.

6. NOTES

6.1 Intended Use. - This standard is intended for use by design organizations engaged in the design of electrical equipment to be used in hazardous locations at KSC facilities.

NOTICE. The Government drawings, specifications, and/or data are prepared for the official use by, or on the behalf of, the United States Government. The Government neither warrants these Government Drawings, Specifications, or other data, nor assumes any responsibility or obligation, for their use for purposes other than the Government project for which they were prepared and/or provided by the Government, or an activity directly related thereto. The fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded, by implication or otherwise, as licensing in any manner the holder or any other person or corporation, nor conveying the right or permission, to manufacture, use, or sell any patented invention that may relate thereto.

Custodian:	Preparing Activity
NASA - John F. Kennedy Space Center	John F. Kennedy Space Center Engineering Development Directorate Mechanical and Electrical Ground Support Systems Office